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The Relationship between Finance and International Trade: An Empirical Analysis on Chinese Firms

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金融と国際貿易の関係

―中国企業の実証分析―

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Abstract

The collapse of world trade after the 2008 Global Financial Crisis attracted many researchers to look into the relationship between finance and international trade. Using two periods of Chinese firm-level data-sets from the World Bank (11, 273 firms in 2005 and 2, 529 firms in 2012) this empirical paper attempts to cross-examine and compare the link between access to finance and export participation over two periods controlling for firm specific characteristics such as firm size, firm age, labor productivity, and foreign ownership. The empirical paper contributes to literature on the relationship between finance and trade by reconfirming the importance of access to credit in export measured by firms' overseas sales ratio using two periods of Chinese micro data. My results also indicate that foreign affiliated firms achieved superior export participation especially in high external finance dependence industries and foreign ownership has the largest marginal effect in determining export extensive. This is consistent with theoretical and empirical findings that foreign owned firms can leverage resources abroad to achieve a better performance measured by export volumes. Lastly, it provides evidence that the development of domestic financial system may lower the role of foreign ownership in boosting export participation, and bank financing is the most important borrowing channel for exporters. The policy implication of the findings is that the government should welcome Foreign Direct Investment (FDI), encourage foreign joint-ventures and support the development of domestic finance especially in banking sector if the country seeks to boost export participation particularly in high external finance dependence sectors such as machinery & equipment and transport machines. The limitation of the study is that its inability to control sunk cost, productivity and solve the endogeneity problem mainly due to data availability. Further studies using panel data are needed to present more meaningful and robust analysis once such data becomes available.

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1. Introduction

In the modern world access to finance is essential to all types of firms as they seek external capital to finance business expansion and/or daily operation. This is particularly true for exporting firms because of the higher sunk cost[2] or export entry cost, longer delivery time and higher risks associated with cross-border trade (Feenstra, 2011). However, the relationship between finance and trade was overlooked by researchers before the collapse of world trade after the 2008 Global Financial Crisis (Baldwin, 2009). This paper using two periods of Chinese firm-level data attempts to cross-examine and compare the relationship between credit constraints and export participation and contribute to the literature of finance-trade nexus by providing new empirical evidence from China.

The theoretical and empirical literature supports the importance of finance in export from both the macro and micro perspectives. On the Macro-level, most studies were based on Heckscher-Ohlin Theory (H-O) Theorem and treated financial development as an endowment of a country in determining trade patterns. Letzer & Bardhan (1987) found out countries with a deep and well-functioned financial market had a comparative advantage in industries with a high dependence on external financing. Beck (2002) showed higher level of financial development through providing good quality of financial services lead to higher export shares and performance in manufactured goods by analyzing a cross country and panel data of 65 countries from 1966 - 1995. Beck (2003) empirically confirmed that financial development could be translated to a comparative advantage in high-external dependence industries using industry-level data of 36 industries and 56 countries. This echoed Rajan & Zingales (1998)'s study of higher level of financial sector development leads to disproportionally higher growth in industries whose working capital depends on external financing. Becker, Chen & Greenberg (2012)'s findings indicated that financial development was positively related to export industries with higher fixed costs and, a well-developed financial market might have a more volatile exports as trade is sensitive to the moves of exchange rate.

On the firm level examination of the relationship between finance and international trade, whether on export participation or export performance/volume, is relatively new owing to late arrival of "New" New Trade Theory[3] and lack of available detailed data. A significant amount of the studies have been focused on the impact of access to finance or credit constraint to export behavior and all evidences show that access to finance is critical in boosting firm's export share and performance. Literatures revealed that companies with easier access to finance tended to self-select as exporters and would continue export (Bernard & Jensen, 2004). Credit constraints preclude otherwise profitable firms from exporting

[2] M. Roberts & J. Tybout (1999), sunk costs of export markets include the cost of packaging, upgrading product quality, establishing market channels, and accumulating information on demand sources.

[3] "New" New Trade Theory refers to the study of heterogeneity of firms such as size, age, productivity, etc. in determining their export behavior and affords to study why only small minority of firms engage in export.

(Melitz, 2003; Manova, 2013), firms with higher productivity and lower credit constraints are likely to export, and credits are important in determining export participation or the extensive rather than the intensive or export volume (Muûls, 2008). Furthermore, Manova (2008) proved that in-commensurate benefits from liberalization in financially vulnerable sectors were not driven by cross-country differences in factor endowments but policy reforms. Minetti & Zhu (2011) using detailed survey data from Italy demonstrated that credit rationing by banks was an obstacle for exporting in high-tech industries and industries heavily relied on external finance. Besedes, Kim & Lugovskyy (2014) developed a model showing credit constraints played a major role in early stages of exporting but not in later stages, and empirically proved it by using product level data on exports to U.S. and 12 EU members over a period of 1989 - 2007[4].

Chinese evidences also support the finance and trade nexusDu & Girma (2007) presented the access to formal financial channels improved exporting intensity of private firms in China. Manova, Wei & Zhang (2009) provided micro-level evidence that foreign affiliated and joint ventures in China had higher export volume than domestic firms in financially high-dependent sectors, especially for firms exporting to countries associated with higher sunk costs. Jarreau & Poncet (2014) using panel data from Chinese customs showed the credit constraints provided an advantage to foreign affiliated firms and joint-ventures over pure domestic private firms in terms of export performance, yet this impact was decreasing as China reforms its financial sector. Publications in Chinese language mirror the findings in overseas that financial development help boost Chinese export (Sun, 2004; Shen, 2006; Yang & Mao, 2010).

The paper is similar to the work done by Du & Girma (2007) Manova, Wei & Zhang (2009) Jarreau & Poncet (2014) in exploring the relationship between finance and trade in China. However, it differs from their studies because the empirical findings are more comprehensive and supports all their arguments in one place by using two periods of Chinese firm-level data and concentrates on export participation ratio rather than export performance.

2. Data: Chinese firm level data of 2005 and 2012

The two periods of micro or firm-level data is based on two World Bank IFC Enterprise Surveys: China - Investment Climate Survey[5] 2005 and China-Enterprise Survey 2012. Applying stratified random sample methodology, the firm-level surveys are conducted by World Bank and private contractors through face-to-face interviews with business owners and top managers (sometimes managers of human resource department and accounting department are asked by top managers to answer questions related to sales and labor

[4] Source: Besedes, Kim & Lugovskyy (2014), Export Growth and Credit Constraints, European Economic Review, Volume 70, August 2014, Pages 350 ~ 370.

[5] Investment Climate Survey was replaced by Enterprise Survey.

questions) mainly in manufacturing and services sectors classified with ISIC codes 15-37, 45, 50-52, 55, 60-64, and 72 (ISIC Rev.3.1). Although many questions may overlap, the surveys are structured to two separate questionnaires for manufacturing and services industry.

The Investment Climate Survey China 2005 dataset was constructed based on a very large number of samples yet the survey questionnaires were relatively less comprehensive. The full data contained 12, 400 observations from 120 cities across China. Dropping State Owned Enterprises (SOEs)[6] and missing variable values[7], the final dataset consists of 11, 273 observations from 120 cities.

The database of World Bank IFC Enterprise Survey China 2012 is well structured with more detailed questions in almost all the fields. The more comprehensive dataset allows researchers to manipulate the data and conduct deeper research. For example, it includes firm-level industry information (20 manufacturing industries and 7 services industries) and detailed information on how external financing is obtained which afford me to examine further on the relationship between finance and export participation by financing channels and industry. However, the drawback of the dataset is that it has a relatively smaller sample size - 2, 700 privately-owned and 148 state-owned firms from twenty from only 25 cities - which lowers the significance of sample indicators and comparison with year 2005. Dropping observations of missing values[8], in variables of interest, the final dataset contains 2, 529 observations. State-Owned Enterprises (SOEs) is deliberately excluded due to its non-market nature.

3. Econometric Model

This paper follows the econometrics model used in a similar study on Asian countries by Asian Development Research Institute (Wignaraja, 2007, 2008; Jinjarak, Mutuc & Wignaraja, 2014) to analyze the relationship between financial access, foreign ownership and export participation rate controlling for firm's other characteristics that may have an impact on export behavior. The baseline equation is as below:

$$y_{it} = \chi'_{it}\beta + \varepsilon_{it}$$

Where i denotes the sample firm; t denotes the year of the survey; y denotes the vector of dependent variable or target variable, which in the this paper is export participation measured by shares of overseas sales (continuous variable) or dummy variable (binary

[6] Chinese SOEs are not in the scope of this study because of their non-market behaviors from time to time. The selection of SOEs is based on its registration status (ownership) in the questionnaire.

[7] 1160 observations dropped: 1 missing value in overseas sales ratio; 5 wrong values in the year of establishment (those values are unreasonable which will put firm's age extremely large); 1160 values for State Owned Enterprises.

[8] 171 observations were dropped due to missing values: employees 1; export participation 2; firm age 72; financial obstacles 27; foreign ownership 7; access to credit (external financing) 62.

variable, 1 if exporting and 0 otherwise); χ is the matrix of firm's heterogeneity - explanatory variable which consists of focal determinant variable access to finance (difficulties in access to finance has 1-5 scales; access to finance is credit from external sources) and different financing channels[9], and control variables such as firm size (number of employees), firm age (number of years since operation), labor productivity (revenue divided by number of employees), foreign ownership (dummy variable, 1 if it has foreign owners, 0 otherwise), etc.; β is the matrix of coefficients or factors and ε denotes the matrix of error terms or disruptions in the mathematical model.

The Tobit Model is mainly used in this paper because the dependent variable - export participation ratio - is continuous and censored with a range between 0 and 100 (Wignaraja, 2007, 2008). Probit Model is often used in studying export participation nevertheless both models are identical.

4. Descriptive analysis: exporters are larger with higher foreign ownership ratio

Table 1 and Table 2 summarize the two data-sets. In general, exporters hire more employees, have higher labor productivity, face less financial obstacle and have a higher share of foreign ownership. Comparison of the two periods shows that firms face less financial obstacles in 2012 than 2005 despite a higher interest rate in the latter year (interest rate in 2004 vs 2011: 5.58% vs. 6.56%) following the development of financial deepening in China. An interesting observation is that exporters in 2012 face more severe financial obstacles than non-exporters measured by the self-reported difficulties in access to credit. This may be because the disproportionate allocation of Chinese 4 trillion RMB stimulus plan to domestic firms and the falling external demand of Chinese exports followed after the Lehman shock[10]. The detailed data of 2012 also reveals that exporters rely more on external financing especially bank lending.

The detailed data in 2012 allows us to conduct an analysis by the degree of external dependence of industries as shown in Table 4. Based on proportion of external sources to finance working capital, industries can be divided into high external finance dependence industry and low external finance dependence industry due to technological component in the process of manufacturing (Rajan and Zingales, 1998). Monova, Wei & Zhang (2011) argued that this table could be also used to form a similar table for China based on industry ranking (ranking is relatively stable across countries) despite the difference in financial sensitivity of industries in the U.S. and China. This paper follows the similar approach by first ranking the

[9] Based on financing sources, financing channels can be categorized to bank financing (bank credit), non-bank financing (credit from non-bank financial institutions), trade credit (credit from suppliers and advances from customers) and other borrowing (borrowing from other, money lenders, friends, family, etc.). Bank and non-bank credits are formal borrowing while informal borrowing includes trade credit and other borrowing.

[10] Following the Lehman shock Chinese government implemented a 4 trillion RMB stimulus plan and contrary to the West it encouraged financial liberalization and innovation.

industries in China given the available data, and then divides the industries according to the rankings of external finance dependence as illustrated in Table 3[11]. It shows that sample means of firms in high external dependence industries are larger, younger, more labor productive,, rely more on external financing, and similar in foreign ownership and difficulties in access to credit. However, none of the above mentioned differences of firm's characteristics is statistically significant except dummy variable exporter and other borrowing. The Difference in Means Column illustrates on average Chinese firms in high external dependence industries are approximately 5.4% more active in export market and have a slightly higher ratio of financing from other sources at 0.4%.

Table 1: Summary Statistics of ICS-China 2005

	All firms (n=11, 273)		Non-Exporter (n=6,940)		Exporter (n=4, 333)		Differences in Means
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	(Exporter minus Non-Exporter)
Exporter	38.437	0.486					
Export Participation	17.465	32.389	0.000	0.000	45.439	38.188	45.439***
Firm Size	861.408	7269.852	421.672	1093.854	1565.716	11610.200	1144.044***
Firm Age	11.704	10.932	11.389	10.564	12.207	11.480	0.817***
Labor Productivity	777.593	24157.58	870.168	30731.13	629.318	2395.077	240.849***
Financial Obstacles	1.366	1.254	1.399	1.281	1.314	1.210	-0.085***
Foreign Ownership	0.234	0.423	0.115	0.320	0.424	0.494	0.309***

Note: ***, **, * denoting statistical significance at the 1%, 5%, and 10% levels

Source: Author's calculation based on World Bank Investment Climate Survey China-2005 dataset

Table 2: Summary Statistics of ES-China 2012

	All firms (n=2, 529)		Non-Exporter (n= 1, 913)		Exporter (n=616)		Differences in Mean
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	(Exporter minus Non-Exporter)
Exporter	24.357	0.429					
Export Participation	11.028	24.701	0.000	0.000	45.276	30.900	45.276***
Firm Size	238.204	1133.922	179.220	947.919	421.378	1564.390	242.158***
Firm Age	12.749	7.968	12.467	7.355	13.625	9.580	1.158***
Labor Productivity	757711.2	6268947	748505.6	7042412	786299.3	2711683	37793.71
Financial Obstacles	0.822	0.880	0.806	0.877	0.873	0.887	0.068**
Foreign Ownership	0.062	0.241	0.033	0.180	0.149	0.357	0.116***
Bank Borrowing	7.041	14.936	5.987	14.161	10.315	16.714	4.328***
Non-bank Borrowing	0.773	5.689	0.797	5.872	0.700	5.080	-0.097
Trade Credit	2.961	9.958	2.539	9.025	4.269	12.331	1.730***
Other Borrowing	0.665	4.271	0.671	4.502	0.649	3.459	-0.021
Access to credit (non-internal)	11.440	20.686	9.994	19.807	15.933	22.639	5.940***
Formal Borrowing	7.814	15.899	6.784	15.299	11.015	17.258	4.231***
Informal Borrowing	3.626	11.092	3.210	10.374	4.919	12.999	1.709***

Note: ***, **, * denoting statistical significance at the 1%, 5%, and 10% levels.

Source: Author's calculation based on World Bank IFC Enterprise Survey China-2012 dataset

[11] Seven industries were dropped from this data-set either because of failure to matching the industries or it does not belong to manufacturing industry.

Table 3: High and Low External Finance Dependence Industry List

High External Finance Dependent Industries	Low External Finance Dependent Industies
Recorded media	Tabacco
Electronics	Leather
Machinery and equipment	Garments
Plastics & rubber	Refined petroleum product
Textiles	Nonmetallic mineral products
Transport machines	Food
Wood	Paper
Basic metals	Chemicals
Fabricated metal products	Furniture

Source: tabulated by the author based on the findings of Rajan, R., Zingales, L., 1998. Financial Dependence and Growth. The American Economic Review 88, 559-586

Table 4: Summary Statistics of ES-China 2012 by Industry

	Low External Finance Dependence Industry (n=590)		High External Finance Dependence Industry (n=972)		Differences in Means
Variable	Mean	Std. Dev.	Mean	Std. Dev.	(High minus low)
Exporter	30.000	0.459	35.391	0.478	5.391**
Export Participation	14.393	28.128	14.674	26.364	0.281
Firm Size	253.778	1038.879	325.503	1524.134	71.725
Firm Age	13.473	7.440	12.978	8.997	-0.494
Labor Productivity	511128.9	1322732	572331.1	2199848	61202.24
Financial Obstacles	0.832	0.873	0.831	0.885	0.001
Foreign Ownership	0.085	0.279	0.071	0.257	-0.138
Bank Borrowing	6.905	14.312	7.483	15.047	0.578
Non-bank Borrowing	0.649	5.790	0.774	4.919	0.125
Trade Credit	3.017	10.556	2.701	8.714	-0.316
Other Borrowing	0.378	2.630	0.770	4.183	0.392**
Access to credit (non-internal)	10.949	19.871	11.726	20.449	0.777
Formal Borrowing	7.554	15.208	8.256	15.817	0.702
Informal Borrowing	3.395	11.206	3.470	9.953	0.075

Note: ***, **, * denoting statistical significance at the 1%, 5%, and 10% levels.

Source: Author's calculation based on World BankIFC Enterprise Survey China-2012 dataset

As shown in Table 5 and Table 6 the Pearson's correlation analysis table indicates a very weak correlation among independent variables respectively. In other words, it means small probability of having a multi-collinearity problem.

Table 5: Pearson's Correlation Coefficient Table of Explanatory variables in 2005

	Size	Age	Labor Productivity	Fin Obs	Foreign
Firm Size	1				
Firm Age	0.0781	1			
Labor Productivity	0.0076	0.0730	1		
Financial Obstacles	0.0076	0.073	-0.0038	1	
Foreign Ownership	0.0194	-0.0771	0.0031	-0.1522	1

Source: Author's calculations based on Chinese ICS data of World Bank IFC in 2005

Table 6: Pearson's Correlation Coefficient Table of Explanatory Variables in 2012

	Size	Age	Labor Productivity	Fin Obs	Foreign	Bank	Nonbank	Trade Credit	Other Borrowing	Access2credit	Formal	Informal
Firm Size	1											
Firm Age	0.1392	1										
Labor Productivity	-0.0021	-0.0088	1									
Financial Obstacles	-0.0263	-0.0012	-0.0163	1								
Foreign Ownership	-0.0059	-0.0332	-0.0059	-0.0229	1							
Bank Borrowing	0.0647	0.0219	-0.1126	0.1978	0.0146	1						
Non-bank Borrowing	-0.0158	-0.0144	-0.0069	0.0327	0.0114	-0.0157	1					
Trade Credit	-0.0231	-0.0372	-0.0023	0.0434	0.0517	0.0982	0.0695	1				
Other Borrowing	-0.0211	-0.0421	-0.0055	0.061	0.0024	0.0899	0.0724	0.0664	1			
Access to credit (non-internal)	0.0269	-0.0147	0.0771	0.1853	0.039	0.7836	0.312	0.5851	0.3233	1		
Formal Borrowing	0.0551	0.0154	0.1033	0.1975	0.0178	0.9338	0.343	0.1171	0.1104	0.8478	1	
Informal Borrowing	-0.0289	-0.0496	-0.0042	0.0625	0.0473	0.1228	0.0902	0.9233	0.4446	0.6497	0.1476	1

Source: Author's calculations based on Chinese firm-level survey data of World Bank IFC in 2012

5.Regression Analysis and Result

5.1 Baseline analysis of 2005 and 2012

In Table 7 the Tobit model reports that firm size is positively associated with export participation in both period (column a and d) at significance level of 1% whilst financial obstacles has a negative sign in 2005 and no statistical significance in 2012. A robustness check using Probit and OLS also shows significance of positive association of size in both periods and negative association of financial obstacles in 2005 and insignificance of financial obstacles in 2012 except in the Probit model (column e) with export participation. Similar to other literatures my findings also indicate a mixed result of the relationship of firm age to firm's export participation with a negative sign in 2005 using Probit and OLS models (column b and c) and a positive sign in 2012 using applying Probit model (column e). A surprise is that

labor productivity is independent from export participation[12]. As shown, financial obstacles discouraged export participation in 2005 as expected while the 2012 result may surprise some with a positive association (result is only significant in using Probit model, column e). This surprising positive association between credit constraint and export participation can be explained by the event of 2008 global financial crisis. Exporters were struggling during and after the crisis due to the sudden drop of external demand. It is not because the financial constraint helped them participate in exporting rather it is because they were already in this exporting business when their financial situation worsened as a consequence of the plunge of world trade.

Table 7: Baseline Estimates of 2005 and 2012

	2005			2012		
	a	b	c	d	e	f
Y= Export Participation	Tobit Y=Export Share (left censored)	Probit Y=1 if Export and 0 otherwise	OLS Y= Export Share	Tobit Y=Export Share (left censored)	Probit Y=1 if Export and 0 otherwise	OLS Y= Export Share
Size (number of thousand employees)	0.513*** (0.000)	0.240*** (0.000)	0.141*** (0.000)	4.919*** (0.002)	0.087*** (0.000)	0.967** (0.000)
Age (number of years since starting operation)	-0.095 (0.078)	-0.004 (0.001)	-0.148*** (0.028)	0.350 (0.257)	0.008** (0.003)	-0.008 (0.062)
Labor Productivity (revenue/#of employees)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Financial Obstacles (difficulty in access to finance 1-5 scales)	-5.460*** (0.698)	-0.409*** (0.010)	-2.353*** (0.242)	2.139 (2.432)	0.055* (0.031)	-0.107 (0.558)
Constant	-16.839*** -1.647	-0.409*** (0.0222)	22.300*** (0.540)	-65.117*** (5.450)	-0.873*** (0.058)	10.988*** (1.037)
Sigma	77.570 1.065			82.724 3.075		
Pseudo/Adj R-squared	0.002	0.066		0.002	0.010	
Observations	11,273	11,273	11,273	2529	2529	2529

Note: ***, **, * denoting statistical significance at the 1%, 5%, and 10% levels, respectively and standard errors are in parentheses.

Source: Author's calculations based on Chinese firm-level survey data of World Bank IFC in 2005 and 2012

[12] Not clear with the reason but it may be a data problem.

In Table 8 includes foreign ownership as a dummy variable in the analysis to examine the impact of foreign ownership as well as having a robustness check. The results reconfirmed the positive association of firm size, ambiguity of firm age and the mixed reading of financial obstacles over two periods. It is noted that the direction of firm age and financial obstacles changed after adapting explanatory variable - foreign ownership and its significance. The regression result of labor productivity is another surprise. These surprising results may be caused by omitted variable and/or multi-collinearity issue (despite the correlation between explanatory variables in 2005 is very weak as shown above). Enlarged reading of the Pseudo R squared and Adjusted R squared in respective model by adding foreign ownership supports the importance of foreign ownership as an explanatory variable. Using Tobit Model, column g and h present foreign ownership has the largest impact over export participation. Being a foreign affiliated firm was associated with 11.8% and 8.1% higher overseas ratio in 2005 and 2012 respectively with a significance level of 1% which implies the importance of the connection foreign ownership to export participation has dropped over the period. This finding is consistent with the argument that domestic financial development in China helped close the gap between privately owned domestic firms and foreign affiliated firms in promoting export. And the effect of increasing 1, 000 employees to export participation had a sharp increase from 0.06% to 0.54% over the period. This indicates the increased effect of firm size and decreased effect of foreign affiliation in relation to export participation.

Table 8: Baseline Estimates of 2005 and 2012 Including Foreign Ownership Indicator

	2005			2012			Marginal Effect	
	a	b	c	d	e	f	g	h
	Tobit	Probit	OLS	Tobit	Probit	OLS	2005	2012
Y= Export Participation	Y=Export Share (left censored)	Y=1 if Export and 0 otherwise	Y= Export Share	Y=Export Share (left censored)	Y=1 if Export and 0 otherwise	Y= Export Share	Marginal Effects after Tobit	Marginal Effects after Tobit
Size (number of thousand employees)	0.389***	0.208***	0.095**	4.930***	0.089***	0.975**	0.058***	0.538***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Age (number of years since starting operation)	0.130*	0.003**	-0.066***	0.454*	0.010***	0.012	0.020*	0.049*
	(0.070)	(0.001)	(0.026)	(0.250)	(0.003)	(0.061)	(0.011)	(0.027)
Labor Productivity	-0.001**	0.017	0.000	0.000	0.000	0.000	0.000**	0.000
(rev./# of employees)	(0.000)	0.010	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Financial Obstacles (difficulty in access to finance 1-5 scales)	-0.579	0.017*	-0.802***	2.623	0.065**	0.020	-0.083	0.286
	(0.635)	(0.010)	(0.224)	(2.375)	(0.031)	(0.548)	(0.095)	(0.259)
Foreign Affiliation/Ownership	75.792***	1.048***	31.183***	70.310***	1.022***	20.103***	11.765	8.102***
	(1.851)	(0.030)	(0.665)	(7.601)	(0.106)	(2.003)	(0.322)	(0.926)
Constant	-41.406***	-0.764***	11.960***	-70.559***	-0.978***	9.383***		
	(1.767)	(0.025)	(0.541)	(5.514)	(0.059)	(1.030)		
Sigma	68.266			80.149				
	(0.923)			(2.968)				
Pseudo R-squared	0.037	0.136		0.013	0.044			
R-squared			0.174			0.040		
Adj R-squared			0.173			0.039		
Observations	11,273	11,273	11,273	2529	2529	2529	11,273	2529

Note: ***, **, * denoting statistical significance at the 1%, 5%, and 10% levels, respectively and standard errors are in parentheses.

Source: Author's calculations based on Chinese firm-level survey data of World Bank IFC in 2005 and 2012

5.2 Financing channels and industry's degree of external finance dependence

Given the detailed data-set of 2012 another robustness check is performed by replacing the financial obstacles variable with new variables - proportion of each borrowing channel in financing working capital - that measure the ability to borrow or gain external credit in the mathematical model as shown in Table 9. The results again statistically proved the strong positive association of firm size, firm age, credit access and foreign ownership with export participation. Decomposing the access to credit by financing sources affords us to examine the criticality of each financing channels. It indicates bank borrowing is the most critical financing channel and formal borrowing dominates against informal financing in connection with export participation. In addition, marginal effects analysis is conducted to explore the effects of adding one unit of explanatory variable to dependent variable. It is observed that largest marginal effect is foreign ownership followed by firm size.

The last regression analysis is performed by industry's degree of external finance dependency as shown in Table 10. Access to credit and the sum of all external borrowing ratios replaced financial obstacles and different borrowing sources to measure the ability to borrow or access to external finance. The results once again confirmed the positive association of firm size, firm age, financial access and foreign ownership and the critical role

Table 9: Baseline Estimates of 2012 by Financing Channels

	a	b	c	d	e	f	g	h
	Tobit	Probit	OLS	Tobit	Probit	OLS	Marginal Effects	
Y= Export Participation	Y=Export Share (left censored)	Y=1 if Export and 0 otherwise	Y= Export Share	Y=Export Share (left censored)	Y=1 if Export and 0 otherwise	Y= Export Share	Marginal Effects after Tobit	Marginal Effects after Tobit
Size (number of thousand employees)	4.4446***	0.082***	0.898**	4.607***	0.084***	0.931**	0.490***	0.505***
	(0.002)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Age (number of years since starting operation)	0.456*	0.010***	0.011	0.471*	0.010***	0.015	0.050*	0.052*
	(0.250)	(0.004)	(0.061)	(0.250)	(0.003)	(0.061)	(0.027)	(0.027)
Labor Productivity (Rev./ # employees)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bank Borrowing	0.608***	0.001***	0.101***				0.067***	
	(0.133)	(0.002)	(0.027)				(0.015)	
Non-bank Borrowing	-0.374	-0.003	-0.093				-0.041	
	(0.412)	(0.005)	(0.085)				(0.045)	
Trade Credit	0.503***	0.008***	0.086*				0.055***	
	(0.195)	(0.003)	(0.049)				(0.021)	
Other Borrowing	-0.158	-0.004	-0.024				-0.017	
	(0.528)	(0.007)	(0.114)				(0.058)	
Formal Borrowing				0.500***	0.008***	0.076**		0.054***
				(0.126)	(0.002)	(0.031)		(0.014)
Informal Borrowing				0.390**	0.006**	0.064		0.043**
				(0.180)	(0.002)	(0.044)		(0.020)
Foreign Ownership	68.905***	1.003***	19.846***	68.878***	1.005***	19.872***	8.012***	7.980***
	(7.558)	(0.106)	(2.001)	(7.571)	(0.106)	(2.002)	(0.929)	(0.927)
Constant	-73.792***	-1.016***	8.596***	-73.986***	-1.017***	8.595***		
	(5.331)	(0.057)	(0.960)	(5.341)	(0.056)	(0.960)		
Pseudo R-squared	0.016	0.057		0.015	0.054			
Adj R-squared			0.043			0.042		
Observations	2,529	2,529	2,529	2,529	2,529	2,529	2,529	2,529

Note: ***, **, * denoting statistical significance at the 1%, 5%, and 10% levels, respectively and standard errors are in parentheses.
Souce: Author's calculations based on Chinese firm-level survey data of World Bank IFC in 2012

of foreign ownership in relation to export participation. Comparing with firms in low external finance dependence industries, the impact of foreign ownership and effects of external credit access to export participation is larger among firms belonging to high external finance dependence industries. In other words, in financially vulnerable sectors firms needs more additional capital in order to have the same effect to or level of overseas sales ratio, and in such sector foreign ownerships are more critical because it can help local firms surpassing the credit constraints experienced by purely domestic private firms. This results echo the theoretical and empirical findings of previous studies such as Rajan & Zingales (1998)'s research on the difference of external finance reliance across sectors, and Du & Girma (2007) and Manova, Wei & Zhang (2011)'s studies on the relationship between credit constraint and export behavior as well as the role of foreign ownership or having joint ventures structure.

6. Main findings

Using Chinese firm-level data of two periods this empirical exercise has several major findings. First, it reconfirmed that firm size, access to credit, and foreign ownership are positively associated with export participation. Second, foreign ownership or affiliation has the largest marginal effect over export participation and it also alleviates the pressure of credit constraints faced by domestic firms. This effect is particularly true for firms in high

Table 10 Baseline Estimates of 2012 by Industry (External Dependence)

	All Industries			Low External Dependent Industries			High External Dependent Industries			Marginal Effects		
	a	b	c	d	e	f	g	h	i	j	k	l
	Tobit	Probit	OLS	Tobit	Probit	OLS	Tobit	Probit	OLS	All	Low	High
Y= Export Participation	Y=Export Share (left censored)	Y=1 if Export and 0 otherwise	Y= xport Share	Y=Export Share (left censored)	Y=1 if Export and 0 otherwise	Y=Export Share	Y=Export Share (left censored)	Y=1 if Export and 0 otherwise	Y= Export Share	Marginal Effects after Tobit	Marginal Effects after Tobit	Marginal Effects after Tobit
Size (number of thousand employees)	4.650***	0.085***	0.936**	5.341	0.189**	1.239	2.574*	0.054**	0.743	0.510***	0.590	0.447*
	(0.002)	(0.000)	(0.000)	(0.003)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
Age (# of years in operation)	0.476*	0.010***	0.015	-0.169	0.007	-0.260*	0.146	0.007	-0.030	0.052*	-0.019	0.025
	(0.250)	(0.003)	(0.061)	(0.549)	(0.008)	(0.156)	(0.260)	(0.005)	(0.092)	(0.273)	(0.061)	(0.045)
Labor Productivity (rev./ # of employees)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Access to credit (external financing)	0.461***	0.007***	0.071***	0.634***	0.010***	0.155***	0.372***	0.008***	0.089**	0.051***	0.070***	0.065***
	(0.097)	(0.001)	(0.023)	(0.203)	(0.003)	(0.057)	(0.112)	(0.002)	(0.040)	(0.011)	(0.022)	(0.019)
Foreign Ownership	68.767***	1.002***	19.861***	54.853***	0.813***	16.426***	53.503***	1.035***	22.529***	7.967***	6.282***	10.018***
	(7.567)	(0.106)	(2.001)	(13.638)	(0.191)	(4.079)	(8.331)	(0.167)	(3.216)	(0.926)	(1.627)	(1.674)
Constant	-74.006***	-1.017***	8.591	-54.641***	-0.870***	14.909***	-34.810***	-0.673***	12.1233***			
	(5.341)	(0.056)	(0.960)	(10.668)	(0.123)	(2.522)	(5.165)	(0.081)	(1.567)			
Sigma	79.827			80.883			61.280					
Pseudo/Adj R-squared	0.015	0.054	0.042	0.014	0.057	0.039	0.013	0.051	0.050			
Observations	2,529	2,529	2,529	590	590	590	972	972	972	2,529	590	972

Note: ***, **, * denoting statistical significance at the 1%, 5%, and 10% levels, respectively and standard errors are in parentheses.
Source: Author's calculations based on Chinese firm-level survey data of World Bank IFC

external finance dependence or financially vulnerable industries. Thirdly, financing channel matters to export behavior and bank borrowing and formal financing still dominate in firms' export participation. Fourthly, firms belong to high external finance dependency or financially vulnerable sectors require more external credit to increase their export participation. Last but not least, the result indicate Chinese firms face less financial obstacles in 2012 than seven years ago and the impact of foreign ownership on export participation dropped. The study echoes the findings of Jarreau & Poncet (2014) that the development of domestic finance in China has increased local banks lending capacity and lowered the importance of the financing function of affiliation with foreign owners Yet there may be another explanation: shift of their China strategies by foreign investors from factor utilization to market driven following China's rebalancing of its economy.

7. Limitation

The biggest challenge or limitation for this empirical research in international economics is lacking of public-available detailed data-sets. In this case the two surveys of 2005 and 2012 have different survey questions (overlapping but latter one is more detailed), few questions addressing the variables of interests (for example, lacking of information on when the firm first started to export), contains a very different sample size as well as the random sampling methods used in the surveys. Furthermore, the variable financial obstacles used to measure the difficulties to gain external credit is a self-reported number and only consist of 5 scales (0 - 4), and this is certainly not the best measurement but it is the only one available in both periods. The limit of data availability prevents to control sunk costs[13], Total Factor Productivity (TFP) and test the real cause of the decreased impact of foreign ownership in export participation.

The endogeneity problem especially the issues of omitted variables and simultaneity may exist in these econometrics models. The data limitation restricts the capacity to control more variables for firm's characteristics as well as finding an Instrumental Variable (IV) to address the endogneity issue. Not ideal, however, previous studies showed that credit access is a driving force rather than a result of export. That is firms with better access to finance are self-selecting as exporters (Bernard & Jensen, 2004; Bellone et al., 2010). Spatareanu & Spatareanu (2010) used firm-level data from Czech Republic shows less financial constraint firms are self-selecting exporters rather than exporting improves financial condition. Nagaraj (2014) proved that financial health is the cause of export and not an effect of export using Indian data.

[13] Author tried to control sunk costs in 2012 by including prior export experience. However, it failed due to data availability (only 548 out of 2700 firms have prior export experiences and 7 firms started to export in the survey year).

8.Conclusion

This study uses Chinese micro-level data of 2005 and 2012 to cross-examine and compare the link between finance and trade over two periods controlling for firm specific characteristics such as firm size, firm age and foreign ownership. The independent variable of finance is measured by self-reported obstacles to access to finance, proportion of total external credit and shares of each borrowing channel in financing working capital respectively, and dependent variable for export participation is overseas sales ratio.

The paper contributes to literature on the link between finance and trade by presenting new evidence on the restrictions of financial obstacles for firm's export participation. My results also indicate the foreign affiliated firm achieved superior export participation especially in high external finance dependence industries, and foreign ownership has the largest marginal effect in determining export extensive. This is consistent with theoretical and empirical findings that foreign owned firms can leverage resources abroad to achieve a better performance measured by export volumes. Lastly, it provides evidence that the development of domestic financial system may have lowered the role of foreign ownership in boosting export participation, and bank financing is the most important borrowing channel for exporters. It implies that governments, as shown in the case of China, should welcome foreign direct investment, encourage joint-ventures with foreign firms, and escalate financial reform and development especially in banking sector if the country seeks to boost export participation particularly in high external finance dependence sectors such as machinery & equipment and transport machines.

Further studies using panel data are needed to present more meaningful and robust analysis once more detailed data of different time periods is available. For instance, if we can match companies across time with information on firm's productivity level, sunk costs, cost of borrowing and how the borrowed money is spent, we will be able to improve the reliability of the estimates and examine whether cost of borrowing affect productivity and firm's export behavior. That is poised to be more practical and useful for policy makers.

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REFERENCES

Ahn, J., Amiti, M., & Weinstein, D. E. (2011). Trade finance and the great trade collapse. In American Economic Review (Vol. 101, pp. 298-302).

Roberts, M. and J. Tybout (1997). "The Decision to Export in Colombia; An Empirical Model of Entry with Sunk Costs." American Economic Review 87(4), p.545-64

Beck, T. (2002). Financial development and international trade. Journal of International Economics, 57(1), 107-131.

Besedeš, T., Kim, B. C., & Lugovskyy, V. (2014). Export growth and credit constraints. European Economic Review, 70, 350-370.

Chor, D., & Manova, K. (2012). Off the cliff and back? Credit conditions and international trade during the global financial crisis. Journal of International Economics, 87(1), 117-133.

Contessi, S., & Nicola, F. De. (2012).What do we know about the relationship between access to finance and international trade? FRB of St. Louis Working Paper 2012-054B.

Do Q. T., & Levchenko, A. a. (2007). Comparative advantage, demand for external finance, and financial development. Journal of Financial Economics, 86(3), 796-834.

Du, J., & Girma, S. (2007). Finance and firm export in China. Kyklos, 60(1), 37-54.

Feenstra, R. C., Li, Z., & Yu, M. (2011). Exports and Credit Constraints Under Incomplete Information: Theory and Evidence from China. National Bureau of Economic Research, Working Paper (16940).

Héricourt, J., & Poncet, S. (2009). FDI and credit constraints: Firm-level evidence from China. Economic Systems, 33(1), 1-21.

Jarreau, J., & Poncet, S. (2014). Credit constraints, firm ownership and the structure of exports in China. International Economics, 139, 152-173. http://doi.org/10.1016/j.inteco.2014.04.004

King, R., & Levine, R. (2004). Finance and Growth Schumpeter Might Be Right. The World Bank, 108(3), 717-737.

Li, Z., & Yu, M. (2009). Exports, Productivity, and Credit Constraints : A Firm-Level Empirical Investigation for China. SSRN 1461399.

Manova, K. (2008). Credit constraints, equity market liberalizations and international trade. Journal of International Economics, 76(1), 33-47.

Manova, K., Wei, S., & Zhang, Z. (2010). Firm Exports and Multinational Activity under Credit Constraints. European Research Workshop in International Trade (ERWIT). 2nd EFIGE Scientific Workshop and Policy Conference, (June), 16-18.

Minetti, R., & Zhu, S. C. (2011). Credit constraints and firm export: Microeconomic evidence from Italy. Journal of International Economics, 83(2), 109-125.

Muûls, M. (2008). Exporters and credit constraints. A firm-level approach. National Bank of Belgium, Working Paper. No 139

Nagaraj, P. (2010). Financial constraints and export participation. International Economics, 140, 1-31.

Poncet, S., Steingress, W., & Vandenbussche, H. (2010). Financial constraints in China: Firm-level evidence. China Economic Review, 21(3), 411-422.

Wignaraja, G. (2007). Foreign Ownership, Technological Capabilities, and Clothing Exports in Sri Lanka ADB Institute Discussion Paper No. 82. ADB Institute Discussion Paper, (82).

Wignaraja, G. (2008). Ownership, technology and buyers: Explaining exporting in China and Sri Lanka. Transnational Corporations, 17(2), 1-15. Retrieved from

Wignaraja, G., & Jinjarak, Y. (2014). Is finance a binding constraint for SME participation in trade ? In JFSA-ADBI-IMF Joint Conference.

Rajan, R., &L. Zingales. (1998). Financial Dependence and Growth. American Economic Review 88(3), p.559-86.

Jinjarak Y., Mutuc P. J., Wignaraja G. (2014) 'Does Finance Really Matter for the Participation of SMEs in International Trade? Evidence from 8,080 East Asian Firms', ADBI Working Paper Series, No.470.

沈能，（2006），金融发展与国际贸易的动态演进分析—基于中国的经验数据，《世界经济研究》，2006 年第 6 期，53-58 页。

杨丹萍和毛江楠（2010），“中国金融发展与对外贸易互动关系研究”—基于中国纺织产业的 VAR 模型分析，《国际贸易问题》，2010 年 04 期, 98-105 页。

孙兆斌，（2004）“金融发展与出口商品结构优化，”《国际贸易问题》第 9 期，64-67 页。